

Nevertheless, the circumstantial evidence in favour of the truth of this impression is, to my mind, so strong that we are justified in considering its bearing upon the general question. It is quite impossible for me on this occasion to set before you at all adequately the general nature of this circumstantial evidence. To do so would involve statements concerning the actual variations of a large number of species already observed in one locality and in several widely distributed localities, with a discussion of the possible direct influence of the conditions of such localities, so far as they are known, upon each of the principal variations. Such statements would necessarily be of such a special and technical kind that, even if time permitted me to make them, they would not be suitable for an Address of this character. I may be permitted to say, however, that I am collecting and preparing the evidence for publication on this point at a later date. There can be no doubt, however, from the evidence I have already submitted to you in part, that some species are far more influenced by changes in the environment, or, to simplify the expression, are far more plastic than others; and we may conclude that in the evolution of other groups of animals the earlier forms were far more plastic than their modern descendants. In the earlier stages of evolution there must have been in the first instance a lessening of the power of change in structure according to change of environment. The fixity or rigidity of certain characters thus produced enabled a more elaborate co-ordination both in form and action to occur between one set of organs and another. It permitted a further localisation and specialisation of functions, or, in other words, further differentiation of the animal tissues.

Accompanying this differentiation there was a loss in the power of regeneration. As Trembley showed many years ago, a Hydra can be cut into many pieces, and each by the regeneration of the parts that are missing will give rise to a complete individual. The Earthworm can, when cut in half, regenerate a new tail but not a new head region. An Arthropod dies when cut in half, but has the power of regenerating new appendages in place of those that are lost. But in Vertebrates there is very little power of regenerating new appendages, and the general powers of regenerating new parts are reduced to a minimum.

Now, whether the loss in the plasticity of characters was the cause of the loss in the power of regeneration of lost parts, or the loss in the powers of regeneration was the cause of the loss of plasticity, is a problem upon which I do not feel we are competent to express a definite opinion; but that the two series of phenomena are intimately associated is, I believe, a generalisation that is worth a good deal of further thought and study.

In Vertebrates, however, although the power of regeneration of lost parts is at a minimum, it is not by any means entirely wanting. The muscles, nerves, epithelia, and other tissues, are able to repair injuries caused by accident and disease. And similarly, although the power of response of various organs to the changes of external conditions in Vertebrates is very much diminished as compared with that in the lower groups of the animal kingdom, it still remains in an appreciable degree. Whether the curves of variation of the so-called fluctuating characters of Vertebrates represent simply or solely the influence of the environment on the organism cannot at present be determined with any degree of certainty; but it appears to me that zoological evidence, confirmed as it is in such a remarkable way by the recent researches of the botanists, points very strongly to the conclusion that the major part of each such curve is, after all, but an expression of the influence of the environment. In venturing to put before you these considerations, I am quite conscious of the vastness and complexity of the problems involved and of the many omissions and imperfections which a short Address of this kind must contain. Not the least of these omissions is that of any reference to the distinction that might be drawn between continuous and discontinuous variations in the simpler forms of life. This is a matter, however, which involves so many interesting and important questions that I have felt it to be beyond the scope of my Address to-day.

We are still in need of further systematic knowledge of the widely distributed species of Coelenterates; we want to be able to form a more definite opinion than we can at present upon the value of specific distinctions, and we need

still further observations and descriptions of the phenomena of irregular facies, abnormal growths, and meristic variations. But more important still is the need of further researches in the field of experimental morphology.

When we have accumulated further knowledge on these lines in a group of animals such as the Coelenterata, of relatively simple organisation, we shall be in a better position than we are now to deal with the problems of heredity and variation in the far more complicated groups of Arthropoda and Vertebrates.

NOTES.

THE following committee has been appointed by the Lord President of the Council to make a preliminary inquiry into allegations that have been made concerning the physical deterioration of certain classes of the population:—Mr. Almeric W. FitzRoy, C.V.O. (chairman), Colonel G. M. Fox, C.B., Mr. J. G. Legge, Mr. H. M. Lindsell, Colonel George T. Onslow, C.B., Mr. John Struthers, C.B., Dr. J. F. W. Tatham.

WRITING to the *Times*, the honorary treasurer of the Cancer Research Fund states that Mr. William Waldorf Astor has just sent a cheque for 20,000*l.* to the fund, and that, as a result of the speech delivered on July 30 by Mr. Balfour, several other donations have also been received; he points out, however, that the fund is still more than 25,000*l.* short of the amount required, and appeals for further help. The address of the fund is the Examination Hall, Victoria Embankment, W.C.

THE Paris correspondent of the *Morning Post* states that particulars of a new anti-tuberculosis serum will shortly be communicated to the Academy of Medicine by the discoverer, Dr. Marmorck, of the Pasteur Institute. The new serum is said to have been tried in the Paris hospitals, and to have cured several comparatively advanced cases of tuberculosis.

COMMANDER PEARY has been granted three years' leave of absence by the U.S. Navy Department to enable him to make another attempt to reach the North Pole. According to Reuter he will start by about July 1 next year, in a new steamer, for the Whale Sound region, where he will embark a number of Eskimos and establish a permanent base at Cape Sabine; thence he will force his way to Grant Land, where he hopes to establish his winter quarters on the northern shore. In the following February, with the earliest light, a start will be made due north over the pack ice with a small, lightly equipped party, which will be followed by a larger party. Commander Peary hopes to reach the Pole and return to his winter quarters within little more than 100 days. The distinctive features of the plan are the use of sledges with comparatively light loads drawn by dogs, the adoption of Eskimo methods and customs, and the fullest possible utilisation of the Eskimos themselves.

REUTER'S Agency learns that Major Powell-Cotton, who has been exploring in Africa for the past year, arrived safely at Wadelai, on the Upper Nile, in the middle of July, from Mount Elgon, where he had been studying the cave-dwellers. Major Powell-Cotton had had satisfactory interviews with the Congo officials, and was then preparing to start on an expedition in search of okapi.

A TELEGRAM from Mombasa on Saturday last states that Lieut.-Col. Bruce, who, with Dr. Nabarro, was despatched from London in February last, on behalf of the Government and the Royal Society, to study the sleeping sickness in Uganda, has left for England on the conclusion of his mission. Lieut.-Col. Bruce is reported to have stated that the ravages of the disease are unabated.

ACCORDING to a telegram from New York, through Laffan's Agency, Mr. W. G. Tight, the president of the University of New Mexico, has made the ascent of Mount Orata, in Bolivia. This is the first time the peak has been scaled.

THE members of the Liverpool School of Tropical Medicine trypanosoma expedition to the Congo Free State (Drs. Dutton, Todd, and Christy) started on Friday last from Southampton.

THE next meeting of the International Congress of Hygiene will be held in Berlin in 1907. The congress has been invited to meet in Washington in 1909.

THE fourth general meeting of the American Electrochemical Society begins on Thursday next at Niagara Falls, New York, and will last for three days. The following is a list of the papers which are to be read and discussed:—"A New Type of Electrolytic Cell," P. G. Salom; "Manufacture of Ferro-alloys in the Electric Furnace," Dr. George P. Scholl; "Electrolytic Copper Refining," Dr. W. D. Bancroft; "Electro-metallurgy of Gold," Dr. W. H. Walker; "Some Theoretical Considerations of Resistance Furnaces," F. A. J. Fitzgerald; "On the Supposed Electrolysis of Water Vapour," F. Austin Lidbury; "Efficiency of the Nickel Plating Tank," Prof. O. W. Brown; "Electrolysis of Sodium Hydroxide by Alternating Current," Carl Hambuechen; "A Practical Utilisation of the Passive State of Iron," Prof. C. F. Burgess; "The Present Status of the Theory of Electrolytic Dissociation," Dr. E. F. Roeber; "Berthelot's Law of Electrochemical Action," C. J. Reed. There will also be a discussion on the theory of electrolytic dissociation.

THE thirteenth annual convention of the American Electro-Therapeutic Association will take place at Atlantic City, New Jersey, from September 22 to 24. A lengthy programme of interesting papers which are to be read at the gathering has been published.

An educational exhibition of edible fungi is to be held under the auspices of the Royal Horticultural Society in the Drill Hall, Buckingham Gate, on September 15. A lecture on the subject of the exhibition will be given in the afternoon by Dr. M. C. Cooke. All interested in extending or acquiring the knowledge of the edible species are invited to send specimens, but notice of an intention to exhibit should, if possible, be sent a few days before to the secretary of the Royal Horticultural Society.

AT the International Congress of Hygiene which has just been held in Brussels the following resolution was passed on the motion of Sir Patrick Manson:—"That this congress, recognising the practical importance of the mosquito malaria theory, would urge on all Governments in malarial countries (1) that officials, both civil and military, be required before taking service in such countries to show evidence of practical knowledge of the theory and its application; (2) that educational establishments, whether governmental, missionary, or other, in such countries be requested to include in their curriculum instruction of native students in the mosquito malaria theory and its practical application; (3) that officials ignorant of the theory or systematically ignoring its practical application be considered as unsuitable for service in malarial countries." In addition to the foregoing resolution the first and second sections of the congress sitting together passed the following resolution:—"That human tuberculosis is perfectly transmissible from one person to another. Nevertheless, in the present state of our knowledge, it is necessary to recommend hygienic measures for the prevention of the propagation of animal tuberculosis in the human species."

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THE Scottish Sanitary Congress was opened at Stranraer on Thursday last, when the president, Prof. Glaister, of Glasgow University, delivered an address, and various papers dealing with sanitary matters were read and discussed. Prof. Glaister, in the course of his remarks, urged that men of science and local authorities should realise the detrimental effect of atmospheric pollution, and together grapple with the subject. The prejudicial effects of town living could not be better demonstrated than in the depreciated physique of the third and fourth generations of many of those who had proceeded from the country to the towns. One of the significant features of present-day statistics, and one calling for the serious consideration of sanitarians, was the high prevailing rate of infantile mortality in populous centres. If the state of the principal English towns for 1901 be considered, it will be found that the infantile death rate varied from 126 per thousand up to 226 per thousand. These figures exhibited a great wastage of infantile life. He affirmed that it was a preventable wastage, and, therefore, worthy the reflections of sanitarians. Such high rates of infantile mortality were bound in the future to become a serious national concern in view of the diminution of the birth rate which had been progressively taking place for the last few decades.

THE fourteenth annual meeting of the Institution of Mining Engineers was held last week in Nottingham under the presidency of Mr. J. C. Cadman. The Institution appears from the report to be in a satisfactory condition, the membership being at present more numerous than at any former period. The present total is 2601 as compared with 2554 of the previous year.

THE Municipal Exhibition at Dresden has been a great success. In all, 128 German communities, including practically the whole of the large cities, contributed officially to it. The exhibition was of a practical nature, and provided a more or less complete survey of municipal achievement, effort, and ideals. It was divided into eight sections, which again were subdivided. The regulation of traffic, lighting, the police and police-courts, ordinary and model dwelling houses, public art galleries, public health, school accommodation and buildings, public education, the care of the poor and the sick, benevolent institutions and charity schools, the financial administration of municipalities, infectious and common diseases and their prevention and cure, safeguards against fire, parks and open spaces, and the growth of towns were among the numerous features of municipal life illustrated.

SHORTLY before his death, the late Prof. Nocard, of Paris, strongly urged the authorities of the Liverpool School of Tropical Medicine to make the institution available for the instruction of veterinary surgeons. A committee has now been formed for the purpose of giving effect to this suggestion, and the veterinary branch is open for the reception and instruction of students. It is under the direction of Profs. Boyce and Sherrington, with adequate assistance, and a farm has been provided at Runcorn for its requirements.

THE Tramways and Light Railways Association offers an annual prize, consisting of a bronze medal and books, for the best essay on improved means of communication. No essay must exceed 4000 words in length, and the right is reserved by the council to publish the papers in the Association's official journal.

A GRANT of 70,000 r. (7000*l.*) has been made to the Moscow University by the Russian Government for the purpose of technical education; of this sum 30,000 r. is allocated to a

physical institute, 15,000 r. to a chemical laboratory, and the balance to physico-geographical, zoological, and botanical teaching.

A NEW gem, lilac coloured and transparent, has recently been discovered in California by Dr. George F. Kunz, of New York. On the suggestion of Dr. C. Baskerville, of the University of North Carolina, who made an analysis of the mineral at the New York Museum of Natural History, the name of Kunzite has, it is stated, been given to the stone in honour of its discoverer. In the course of the tests made by Dr. Baskerville, the Kunzite crystals were subjected to the action of ultra-violet light without showing any evidence of fluorescence or phosphorescence, and it was not until Röntgen rays of very high penetration were brought to bear upon them that they became at all fluorescent. On their removal to a dark chamber they exhibited a persistent white luminosity never before observed in this class of minerals. A description of the gem, by Dr. Kunz, appears in *Science* of August 28.

THE *Pioneer Mail*, Allahabad, states that the Ceylon Government has given notice that, under the Insect Pest Ordinance, the importation of pepper plants into Ceylon from any part of India is prohibited. The dried seed of the pepper plant imported for commercial use is, however, exempt from the prohibition.

THE daily weather report issued by the Meteorological Office on Friday last, September 4, showed that a barometric depression had passed the Azores and was advancing on an easterly course; the mercury was lowest on the west coast of Ireland, with south-easterly winds, and the air becoming close and thundery. As occasionally happens, a secondary depression was developed to the southward of the primary system, and this subsidiary disturbance caused during the afternoon severe thunderstorms over the southern portion of England, which subsequently extended to the metropolis and eastern coast, accompanied by torrential rain, laying many districts under water. At Ventnor a fall of 1.65 inches was recorded the next morning, at Westbourne 2.4 inches, and at Brixton 1.2 inches. At some places the fall was probably greater, as at Dover the shipment of mails was delayed, and many houses in the low-lying districts of that town were flooded to the depth of several feet.

PROF. LANGLEY has addressed a statement to the American Press with reference to his mechanical flight experiments from which we abstract the following:—"These trials, with some already conducted with steam-driven flying machines, are believed to be the first in the history of invention where bodies far heavier than the air itself have been sustained in the air for more than a few seconds by purely mechanical means. In my previous trials success has only been reached after initial failures, which alone have taught the way to it, and I know no reason why prospective trials should be an exception. . . . The fullest publicity consistent with the national interest (since these recent experiments have for their object the development of a machine for war purposes) will be given to this work when it reaches a stage which warrants publication."

MR. EDISON is reported to have developed his alkaline storage battery into a form fit for commercial use, and already has works equipped capable of turning out per day one complete set of cells suitable for motor-car work; soon he will be able to turn out five sets a day. The results of tests of the practical working of the battery are said to be entirely satisfactory; four sizes are made, capable of running a car 25, 50, 75, and 100 miles respectively on one

charge, at an even rate of 25 miles an hour. The possibility of working at more than normal discharge rates without injury to the cells gives cars equipped with this battery good hill-climbing powers. The results of general outside experience of the battery will be eagerly awaited.

MR. MARCONI, who recently went out to America on board the *Lucania*, had special apparatus fitted on the ship to enable him to carry out experiments during the voyage. The main object of the experiments was to determine the power necessary to transmit messages to and from a moving station, such as a ship, with varying distances.

It is announced that the Metropolitan District Railway will be equipped with trains run on the multiple unit train control, which is in use on the Central London and several American railways. Each train will have three motor-cars all controlled by a single driver; if by any accident the driver is incapacitated, the train is automatically brought to a standstill as soon as he releases his hold on the driving lever. The motor equipment is separated from the public part of the car by a fireproof steel partition. The contract for the equipment (known as the Sprague-Thomson Houston system) has just been placed with the British Thomson Houston Company, of Rugby and London.

THE supervision of the Imperial Department of Agriculture for the West Indies extends to several islands, where the progress that is being made is not placed on record except in the yearly reports. Of these, the report which originates from St. Vincent refers to the eruptions of Mont Soufrière during the period included in the official year 1902-3. The botanic gardens escaped, but the Georgetown experimental plot was almost entirely destroyed; even this catastrophe was turned to account, as experiments were started in order to test the possibility of growing certain plants, such as sugar-canes, cotton, ground-nuts, &c., in the volcanic ash. The experiment station of the British Virgin Islands is situated at Tortola, and the yearly report is presented by Mr. Fishlock, who took up the position of agricultural instructor at the beginning of the year. The station lies low, and is not suited to the cultivation of cacao or coffee, but pines produce excellent crops, and there is every reason to expect that good results will attend the introduction of cotton cultivation.

A PAPER entitled "The Forward Movement in Plant-breeding" was read by Prof. L. H. Bailey before the American Philosophical Society, and is published in its *Proceedings*. The advice which is offered to the scientific breeder is to get thoroughly acquainted with the characteristics and qualities of the plant which it is desired to cultivate, to decide in what direction he can make practical improvements, and after choosing what appears to be a suitable strain, to get all the information possible from his results by means of a careful system of measurement and tabulation.

IN the September issue of the *Irish Naturalist* Messrs. Carpenter and Beresford publish the result of certain experiments as to the relations existing between the wasps respectively known as *Vespa austriaca* and *V. rufa*. The former, which is not uncommon in Ireland, is believed to produce no workers, but to breed as an "inquiline" in the nests of other species. In a nest with an *austriaca* queen kept under observation by the authors, all the workers hatched were of the *rufa* type, while of the drones some were *austriaca*, some *rufa*, and others intermediate between the two. As the two forms are sufficiently distinct to be regarded as species, it seems as if we had here an instance of the origin of species by discontinuous variation. "We

think that we see here a new species arise by the production, through many generations, of an increasing number of individuals (*rufa* forms) among the offspring, that are markedly unlike the parents (*austriaca* forms). We believe that *austriaca* forms give rise to *rufa* forms, but we have no evidence of the reverse process."

At the conclusion of the second part of his memoir on the development of the molluscan lingual ribbon, or radula, Mr. H. Schnabel, in the *Zeitschrift für wissenschaftliche Zoologie*, vol. lxxiv. part iv., points out an important distinction in this between cephalopods and gastropods. In contrast to the cephalopods, the development of the radula in the gastropods commences, not with the appearance of the single unpaired median row of teeth, but with a number of paired lateral rows. The other contents of the issue include an article on gastrulation in *Cucullanus*, by E. Martini; an essay on the morphology of the male genital appendages of the Lepidoptera, by E. Zander; and an account of the structure of the bristles in certain chætopods and brachiopods, by A. Schepotieff.

THE alleged occurrence of "aptosochromatism," that is, colour-change in feathers without moulting, in birds, has by no means met with universal acceptance, one at least of the late Mr. F. J. Birtwell's three papers on this subject having been adversely criticised. Shortly before his death Mr. Birtwell entered on a fresh series of observations in the hope of establishing his theory on a basis which would be beyond question. These observations, which were made on two species of buzzard, are now published in the *Bulletin* of the Hadley Laboratory of the University of New Mexico (vol. iii. No. 7).

AN Irish specimen of Dopplerite has been described by Mr. Richard J. Moss (*Sci. Proc. Royal Dublin Soc.*, vol. x. No. 6). It was found in peat in Sluggan bog, at Drumsco, near Cookstown Junction, in County Antrim. In its original moist condition it appeared like a stiff jelly of a velvety-black colour, but when dry it became very like jet, breaking with a conchoidal fracture, and exhibiting a vitreous lustre. Dopplerite was originally found in peat in Styria, and has not previously been recorded from Britain. It appears to have been formed from peat by a process of oxidation.

A HANDBOOK to Southport, which should prove of much service to those attending the meeting who are not well acquainted with the town, has been written for the members of the British Association. Southport is considered from a historical and descriptive point of view, and as a health resort. Other chapters are devoted to meteorology, geology, botany, zoology, Martin Mere, archaeology, and the life and works of the Rev. Jeremiah Horrocks (spelt in the volume Horrox). The volume is published by Messrs. Fortune and Chant, of Southport, and appears to have been carefully prepared.

THE current issue of the *Illustrated Scientific News* is a double one, and brings to a close our contemporary's first volume. The number contains many interesting articles, among which there are no fewer than three respecting the British Association; one is illustrated by portraits of the president and five of the presidents of sections for this year. Other contributions deal with "Charlottenburg," the "Solar Physics Observatory at Meudon," "Progress with Airships," &c.

THE additions to the Zoological Society's Gardens during the past week include two Black Rats (*Mus rattus*), British,

presented by Mr. J. E. Millais; a Ducorps's Cockatoo (*Cacatua ducorpsi*) from the Solomon Islands, presented by Mrs. J. Aarons; a Neumann's Baboon (*Papio neumanni*), a Doguera Baboon (*Papio doguera*) from Abyssinia, a Bell's Cinixys (*Cinixys belliana*) from Tropical Africa, an Adanson's Sternothera (*Sternotherus adansonii*) from North-east Africa, deposited; three Fat-tailed Desert Mice (*Pachymys dupresi*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SEARCH-EPIHEMERIS FOR FAYE'S COMET.—In No. 3896 of the *Astronomische Nachrichten*, Herr E. Strömgen gives a continuation of the search-ephemeris for Faye's comet which appeared in No. 3876 of the same periodical, and was reproduced in these columns. The following is an extract from the later portion:—

Ephemeris 12h. (M. T. Berlin).									
1903	h. m. s.		δ		log r		log Δ		
Sept. 12	...	8 5 14	...	+12	13'4	...	0.2842	...	0.3864
" 16	...	8 13 26	...	+11	34.8	...	—	...	—
" 20	...	8 21 24	...	+10	55.5	...	0.2930	...	0.3821
" 24	...	8 29 6	...	+10	15.5	...	—	...	—
" 28	...	8 36 31	...	+9	35.1	...	0.3020	...	0.3771
Oct. 6	...	8 50 32	...	+8	13.4	...	0.3110	...	0.3712
" 14	...	9 3 28	...	+6	51.6	...	0.3201	...	0.3645
" 22	...	9 15 15	...	+5	30.7	...	0.3293	...	0.3569
" 30	...	9 25 48	...	+4	11.8	...	0.3384	...	0.3484

THE CANALS ON MARS.—In the fifth report of "The Section for the Observation of Mars" (British Astronomical Association *Memoirs*, vol. xi.), several charts of the planet's surface are reproduced, in one of which, Plate viii., the director of the section, M. E. M. Antoniadi, has omitted the reticulated canal systems so familiar to aërographers on the charts published during the last twenty-five years. These have been omitted because recent research has thrown grave doubts on their objective reality.

In the recent experiments carried out by Messrs. Maunder and Lane it was demonstrated that the regular "canaliform" markings may be consistently seen by numerous unbiased individuals on a surface which is free from any such markings, but which has drawn on it features similar to the other markings on Mars. It was also pointed out that, in general, the so-called canals on aërographical maps are drawn either from one projecting feature to another or where half-tone boundaries are seen on the planet, just where one would expect them to be drawn if they were really due to physiological suggestion.

Many so-called "canals" are retained on M. Antoniadi's chart, but these are not of the rigidly geometrical shape shown on the charts published during recent years, and are, probably, objective features of the Martian landscape (the *Observatory*, No. 335).

RADIATION PRESSURE AND COMETARY THEORY.—In No. 5, vol. xvii., of the *Astrophysical Journal*, Messrs. E. F. Nicholls and G. F. Hull describe and illustrate some laboratory experiments they have made at Dartmouth College, Hanover, U.S.A., in order to demonstrate the effect of the solar radiation pressure in the formation of comets' tails.

A glass tube shaped like an hour-glass was partially filled with sand and dried lycopodium powder, and then highly evacuated. On causing the sand and powder to fall from the upper to the lower part of the tube, and directing an intense beam of light against the stream, it was seen that, whilst the sand fell vertically, the powder was diverted in the direction of the beam against the side of the tube opposite to the light source. Unfortunately the light pressure, on particles of the size and density used, had been previously overestimated, and a subsequent calculation showed that the observed deviation may not have been wholly due to the light-pressure, although some of it was.

Another suggestion as to the cause of repulsion in cometary phenomena is that the particles heated from one side evolve gases, and are, therefore, driven in the opposite